AC6366C Datasheet

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Version： V1.3

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AC6366C Features

CPU
- 32-bit DSP supports hardware Float Point Unit (FPU)
- Up to 160MHz programmable processor
- 64Vectored interrupts
- 4 Levels interrupt priority

DSP Audio Processing
- SBC, AAC Audio decodes supported for BT audio
- mSBC voice codecs supported for BT phone
- Supports MP2, MP3, WMA, APE, FLAC, AAC, MP4, M4A, WAV, AIF, AIFC audio decoding
- Packet Loss Concealment (PLC) for voice processing
- Acoustic echo cancellation/suppression (AEC,AES)
- Single/Dual MIC Environmental Noise Cancellation (ENC)
- Multi-band DRC limiter
- 30-band EQ configuration for voice Effects

Audio Codec
- Two channels 16-bit DAC, SNR >= 92dB
- Three channels 16-bit ADC , SNR >= 90dB
- Sampling rates of 8KHz/11.025KHz/16KHz/22.05KHz/24KHz/ 32KHz/44.1KHz/48KHz are supported
- One analog MIC amplifier, build-in MIC bias generator
- Supports two PDM digital MIC inputs three channels Stereo analog MUX
- Supports cap-less, single-ended, and differential mode at the DAC path
- Supports 16ohm and 32ohm Speaker loading

Bluetooth
- Compliant with Bluetooth V5.4+BR+EDR+BLE specification
- Meet class1 class2 and class3 transmitting

power requirement
- Support GFSK and π/4 DQPSK all packet types
- Provides +6dbm transmitting power receiver with -90dBm sensitivity
- Fast AGC for enhanced dynamic range
- Supports a2dp\avctp\avdtp\avrcp\hfp\spp\smp\att\gap\ gatt\rfcomm\sdp\l2cap profile

Peripherals
- One full speed USB 2.0 OTG controller
- Six multi-function 32-bit timers, support capture and PWM mode
- Three full-duplex basic UART, UART0 and UART1 supports DMA mode
- Two SPI interface supports host and device mode
- One hardware IIC interface supports host and device mode
- 10-bit ADC for analog sampling
- External wake up/interrupt on all GPIOs

PMU
- Low voltage LDO for internal digital and analog circuit supply
- 3uA current consumption in the soft-off mode
- Built-in LDO for the core, I/O, Bluetooth and flash
- VBAT is 2.0V to 4.5V
- VDDIO is 2.0V to 3.4V

Temperature
- Operating temperature: -40℃ to +85℃
- Storage temperature: -65℃ to +150℃

Packages
- QFN32(4mm*4mm)

Applications
- Bluetooth   IOT
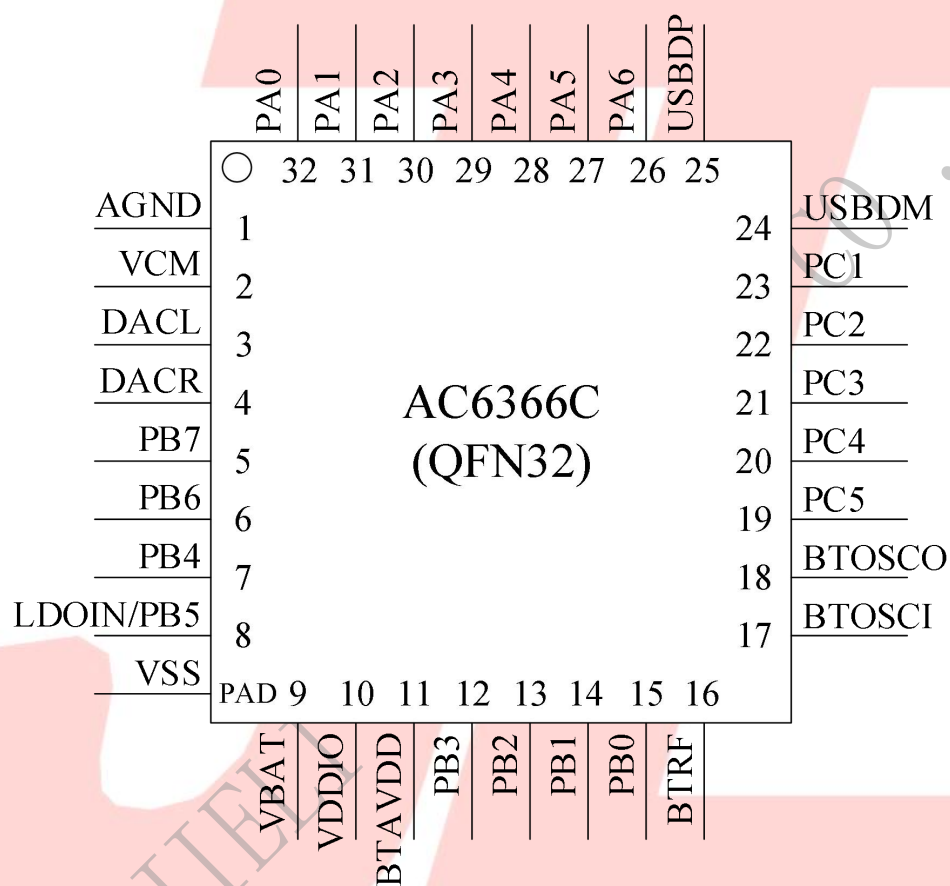
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1、Pin Definition

1.1 Pin Assignment

Figure 1-1   AC6366C_QFN32 Package Diagram

1.2 Pin Description

Table 1-1 AC6366C_QFN32 Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	AGND	P	/		Ground for audio DAC logic
2	VCM	P	/		DAC Reference
3	DACL	O	/		DAC Left Channel
4	DACR	O	/		DAC Right Channel
5	PB7	I/O	24/8	GPIO	SPI2DOA: SPI2 Data Out(A) IIC_SDA_C: IIC DAT(C) ADC9: ADC Input Channel 9 PWM5: Timer5 PWM Output UART1RXA: Uart1 Data In(A)
6	PB6	I/O	24/8	GPIO	SPI2CLKA: SPI2 Data Out(A) IIC_SCL_C: IIC SCL(C) ADC8: ADC Input Channel 8 TMR3: Timer3 Clock Input UART1TXA: Uart1 Data Out(A)
7	PB4	I/O	24/8	GPIO	ADC7: ADC Input Channel 7 CLKOUT1 UART2TXC: Uart2 Data Out(C) UART2RXC: Uart2 Data In(C)
8	PB5	I/O	8	GPIO (High Voltage Resistance)	PWM3: Timer3 PWM Output SPI2_DIA: SPI2 Data In(A) CAP1: Timer1 Capture UART0TXC: Uart0 Data Out(C) UART0RXC: Uart0 Data In(C)
	LDOIN	P	/		Battery Charger In
9	VBAT	P	/		Battery Power Supply
10	VDDIO	P	/		IO Power 3.3v
11	BTAVDD	P	/		BT Power
12	PB3	I/O	/	GPIO	SD0DAT_D: SD0 Data(D); ADC6: ADC Input Channel 6 PWM2: Timer2 PWM Output UART2RXB: Uart2 Data In(B)

13	PB2	I/O	8	GPIO (High Voltage Resistance)	SD0CMD_D: SD0 Command(D) SPI1DIA: SPI1 Data In(A) CAP0: Timer0 Capture UART2TXB: Uart2 Data Out (B)
14	PB1	I/O	24/8	GPIO (pull up)	Long Press Reset SPI1DOA: SPI1 Data Out(A) ADC5: ADC Input Channel 5 TMR2: Timer2 Clock Input UART0RXB: Uart0 Data In(B)
15	PB0	I/O	8	GPIO (High Voltage Resistance)	SD0CLK_D:SD0Clock(D) SPI1CLKA:SPI1 Clock(A) UART0TXB:Uart1 Data Out(B) TMR5:Timer5 Clock Input
16	BTRF	/			BT Antenna
17	BTOSCI	I			BT OSC In
18	BTOSCO	O			BT OSC Out
19	PC5	I/O	24/8	GPIO	SD0CLK_AE: SD0 Clock(AE) SPI1DOB: SPI1 Data Out(B) IIC_SDA_B: IIC SDA(B) ADC12: ADC Input Channel 12 TMR1: Timer1 Clock Input UART2RXD: Uart2 Data In(D)
20	PC4	I/O	24/8	GPIO	SD0CMD_A: SD0 Command(A) SPI1CLKB: SPI1 Clock(B) IIC_SCL_B: IIC SCL(B) ADC11: ADC Input Channel 11 PWM1: Timer1 PWM Output UART2TXD: Uart2 Data Out (D)
21	PC3	I/O	24/8	GPIO	SD0DAT_A: SD0 Data(A) SPI1DIB: SPI1 Data In(B) CAP2: Timer2 Capture UART0TXD: Uart0 Data Out (D) UART0RXD: Uart0 Data In(D)
22	PC2	I/O	24/8	GPIO	ADC10: ADC Input Channel 10 CAP5: Timer5 Capture UART1RXB: Uart1 Data In(B)
23	PC1	I/O	24/8	GPIO	TMR0: Timer0 Clock Input UART1TXB: Uart1 Data Out(B)
24	USBDM	I/O	4	USB Negative Data (pull down)	IIC_SDA_A: IIC SDA(A) SPI2_DOB: SPI2 Data Out(B) ADC14: ADC Input Channel 14 UART1RXD: Uart1 Data In(D)

25	USBDP	I/O	4	USB Positive Data (pull down)	IIC_SCL_A: IIC SCL(A) SPI2_CLKB: SPI2 Clock(B) ADC13: ADC Input Channel 13 UART1TXD: Uart1 Data Output(D)
26	PA6	I/O	24/8	GPIO	IIC_SDA_D: IIC SDA(D) ADC4: ADC Input Channel 4 CAP4: Timer4 Capture UART0RXA: Uart0 Data In(A)
27	PA5	I/O	24/8	GPIO	IIC_SCL_D: IIC SCL(D) PWM0: Timer0 PWM Output UART0TXA: Uart0 Data Output(A)
28	PA4	I/O	24/8	GPIO	SD0CMD_CE: SD0 Command(CE) UART1_RTS: Uart1 Request to send ADC3: ADC Input Channel 3 TMR4: Timer4 Clock Input UART2RXA: Uart2 Data In(A)
29	PA3	I/O	24/8	GPIO	SD0DAT_C: SD0 Data(C) UART1_CTS: Uart1 Clear to send ADC2: ADC Input Channel 3 PWM5: Timer5 PWM Output UART2TXA: Uart1 Data Output(D)
30	PA2	I/O	24/8	GPIO	MIC BIAS: Microphone Bias Output SD0CLK_C: SD0 Clock(C) CAP3: Timer3 Capture
31	PA1	I	24/8	GPIO	MIC: MIC Input Channel ADC1: ADC Input Channel 1 PWM4: Timer4 PWM Output UART1RXC: Uart0 Data In(C)
32	PA0	I/O	/	GPIO	SDPG: SD Power Supply ADC0: ADC Input Channel 0 CLKOUT0 UART1TXC: Uart1 Data Output(C)
	PAD	P	/		Ground

2、 Electrical Characteristics

2.1 Absolute Maximum Ratings

Table 2-1

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-40	+85	°C
Tstg	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	-0.3	4.5	V
LDOIN	Charger Voltage	-0.3	6	V
$V_{3.3IO}$	3.3V IO Input Voltage	-0.3	3.6	V

Note : The chip can be damaged by any stress in excess of the absolute maximum ratings listed below

2.2 Recommended Operating Conditions

Table 2-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VBAT	Voltage Input	2.0	3.7	4.5	V	-
LDOIN	Charger Voltage	4.5	5	5.5	V	-
V_{VDDIO}	Voltage output	2.0	3.0	3.4	V	VBAT = 4.2V, 100mA loading
V_{BT_AVDD}	Voltage output	-	1.3	-	V	VBAT = 4.2V, 100mA loading
I_{vddio}	Loading current	-	-	150	mA	VBAT = 4.2V

2.3 Battery Charge

Table 2-3

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
LDOIN	Charge Input Voltage	4.5	5	5.5	V	-
V_{Charge}	Charge Voltage	4.15	4.2	4.25	V	-
I_{Charge}	Charge Current	20	-	300	mA	Charge current at fast charge mode
I_{Trikl}	Trickle Charge Current	20	45	70	mA	$V_{BAT} < V_{Trikl}$

2.4 IO Input/Output Electrical Logical Characteristics

Table 2-4

IO input characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{IL}	Low-Level Input Voltage	-0.3	-	0.3* VDDIO	V	VDDIO = 3.3V
V_{IH}	High-Level Input Voltage	0.7* VDDIO	-	VDDIO+0.3	V	VDDIO = 3.3V
IO output characteristics						
V_{OL}	Low-Level Output Voltage	-	-	0.33	V	VDDIO = 3.3V
V_{OH}	High-Level Output Voltage	2.7	-	-	V	VDDIO = 3.3V

2.5 Internal Resistor Characteristics

Table 2-5

Port		General Output	High Drive	Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA1~PA6 PB1,PB4,PB6,PB7 PC1~PC5		8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、PB0,PB2,PB5 can pull-up resistance to 5V 4、internal pull-up/pull-down resistance | accuracy ±20%
PA0 PB3	Output 0	8mA	24mA	10K	10K	
	Output 1	8mA	64mA			
PB0, PB2, PB5		8mA	-	10K	10K	
USBDP		4mA	-	1.5K	15K	
USBDM		4mA	-	180K	15K	

2.6 DAC Characteristics

Table 2-6

Parameter	Min	Typ	Max	Unit	Test Conditions
Frequency Response	20	-	20K	Hz	
THD+N	-	-75	-	dB	1KHz/0dB
S/N	-	92	-	dB	10Kohm loading
Crosstalk	-	-80	-	dB	With A-Weighted Filter
Output Swing	-	1	-	Vrms	
Dynamic Range	-	90	-	dB	1KHz/-60dB 10Kohm loading With A-Weighted Filter
DAC Output Power	11	-	-	mW	32ohm loading

2.7 ADC Characteristics

<p align="center">**Table 2-7**</p>

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range	-	80	-	dB	1KHz/-60dB
S/N	-	90	91	dB	
THD+N	-	-70	-	dB	1KHz/-60dB
Crosstalk	-	-80	-	dB	

2.8 BT Characteristics

2.8.1 Transmitter

Basic Rate   **Table 2-8**

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power		-	4	6	dBm	25℃, Power Supply VBAT=3.7V 2441MHz DH5
RF Power Control Range		-	20	-	dB	
20dB Bandwidth		-	950	-	KHz	
In-band spurious Emissions (BQB Test Mode RF_Tx Power=4dBm)	$F=F_0\pm1MHz$	-	-20	-	dBm	
	$F=F_0\pm2MHz$	-	-45	-	dBm	
	$F=F_0\pm3MHz$	-	-35	-	dBm	
	$F=F_0\pm>3MHz$	-	-45	-	dBm	

Enhanced Data Rate   **Table 2-9**

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power		-	-1	-	dB	25℃, Power Supply VBAT=3.7V 2441MHz 2DH5
$\pi/4$ DQPSK Modulation Accuracy	DEVM RMS	-	4	-	%	
	DEVM 99%	-	10	-	%	
	DEVM Peak	-	7	-	%	
In-band spurious Emissions (BQB Test Mode RF_Tx Power=4dBm)	$F=F_0\pm1MHz$	-	-4	-	dBm	
	$F=F_0\pm2MHz$	-	-30	-	dBm	
	$F=F_0\pm3MHz$	-	-30	-	dBm	
	$F=F_0\pm>3MHz$	-	-37	-	dBm	

2.8.2 Receiver

Basic Rate   **Table 2-10**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-	-88	-	dBm	
Co-channel Interference Rejection		-	6	-	dB	25℃,
Adjacent Channel selectivity C/I	+1MHz	-	-6	-	dB	Power Supply
	-1MHz	-	-8	-	dB	
	+2MHz	-	-17	-	dB	VBAT=3.7V
	-2MHz	-	-21	-	dB	2441MHz
	+3MHz	-	-15	-	dB	DH5
	-3MHz	-	-31	-	dB	

Enhanced Data Rate   **Table 2-11**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-	-90	-	dBm	
Co-channel Interference Rejection		-	9	-	dB	25℃,
Adjacent Channel selectivity C/I	+1MHz	-	-10	-	dB	Power Supply
	-1MHz	-	-13	-	dB	
	+2MHz	-	-11	-	dB	VBAT=3.7V
	-2MHz	-	-21	-	dB	2441MHz
	+3MHz	-	-13	-	dB	2DH5
	-3MHz	-	-40	-	dB	

2.8.3 BLE

1M Data Rate   Table 2-12

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-	-91	-	dBm	
RF Transmit Power		-	6	-	dBm	
In-band Spurious Emission	|M-N|=2MHz	-	-41	-	dBm	25℃
	|M-N|≥3MHz	-	-40	-	dBm	Power Supply
Modulation Characteristics	Δf1 avg	-	250	-	KHz	VBAT=3.7V
	Δf2 99%	-	210	-	KHz	2440MHz
	Δf1avg/Δf2avg	-	0.9	-	/	
Carrier Frequency Offset		-50	-	+50	KHz	
Frequency Drift		-25	-	+25	KHz	
Frequency Drift Rate		-5	-	+5	KHz/50us	

2M Data Rate   Table 2-13

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity		-	-89	-	dBm	
RF Transmit Power		-	6	-	dBm	
In-band Spurious Emission	|M-N|=4MHz	-	-45	-	dBm	25℃
	|M-N|=5MHz	-	-45	-	dBm	Power Supply
	|M-N|≥6MHz	-	-45	-	dBm	
Modulation Characteristics	Δf1 avg	-	500	-	KHz	VBAT=3.7V
	Δf2 99%	-	430	-	KHz	2440MHz
	Δf1avg/Δf2avg	-	0.9	-	/	
Carrier Frequency Offset		-50	-	+50	KHz	
Frequency Drift		-25	-	+25	KHz	
Frequency Drift Rate		-5	-	+5	KHz/50us	

Long Range   Table 2-14

Parameter	Min	Typ	Max	Unit	Test Conditions
Sensitivity LE 125K(S8)	-	-99	-	dBm	VBAT=3.7V,25℃
Sensitivity LE 500K(S2)	-	-95	-	dBm	2440MHz

3、Package Information

3.1 QFN32(4mm*4mm)

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	3.90	4.00	4.10
D2	2.60	2.65	2.70
e	0.40BSC		
Nd	2.80BSC		
E	3.90	4.00	4.10
E2	2.60	2.65	2.70
Ne	2.80BSC		
K	0.20	-	-
L	0.35	0.40	0.45
L1	0.30	0.35	0.40
L2	0.15	0.20	0.25
h	0.30	0.35	0.40
L/F载体尺寸(MIL)	112*112		

EXPOSED THERMAL PAD ZONE

BOTTOM VIEW
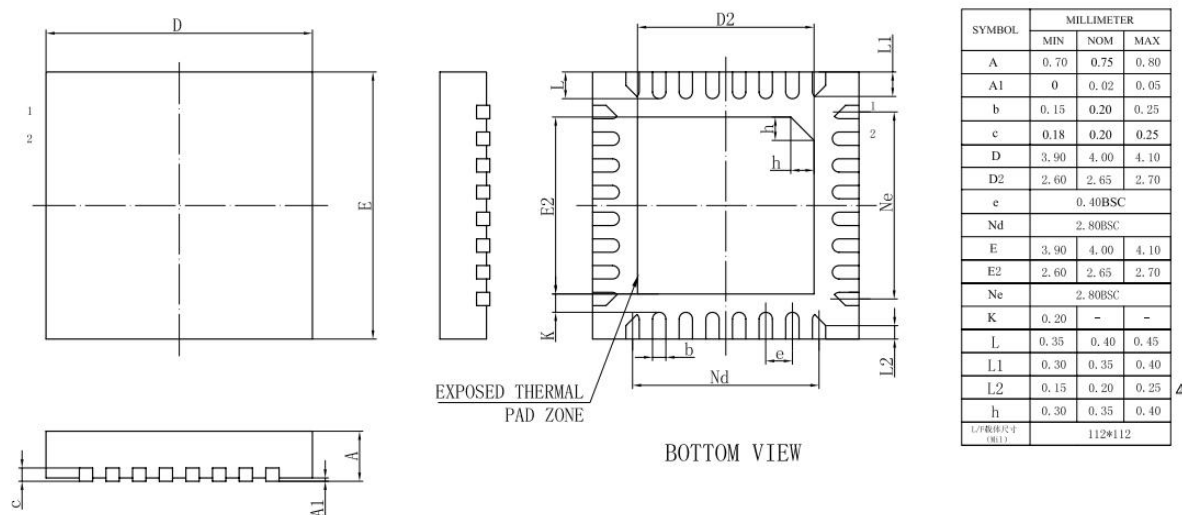
Figure 3-1   AC6366C_QFN32 Package

4、Revision History

Date	Revision	Description
2020.08.26	V1.0	Initial Release
2022.07.19	V1.1	Update Bluetooth Feature
2024.03.06	V1.2	Update Bluetooth Feature, Add BLE Parameter
2024.06.27	V1.3	Update Pin Description, Add Audio Parameter